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Four lessons on the interaction between climate change mitigation policies and social behaviour

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Theme

To properly implement climate change mitigation policies, it is crucial to understand the interaction between these policies and people's behaviour, both at the individual and the social levels. Doing so leads to specific recommendations that can improve policy acceptability.

Summary

Based on the Elcano Royal Institute's 2019 survey on the attitudes of Spanish citizens on the environment and climate change, we have designed a model to understand how climate change mitigation policies and individuals' norms and attitudes interact, which in turn allows us to make policy recommendations to successfully address the climate challenge. We summarise our contributions in the form of four lessons. First, whenever the politicians do not show any interest in promoting climate change mitigation policies, the strength of public support for the issue vanishes. Second, peer (social) influence, through people's reference group, modulates the effect of individual factors, such as income. Third, policies based on the assumption that all agents have the same capabilities have less impact than expected or with respect to policies that are tailored towards a heterogeneous population (in terms of income). Finally, the implementation of national mitigation policies cannot be done without also considering the regional differences in public support within a country. Some communities react more positively to specific policies than others and large differences may lead to polarisation.

Analysis

The need for an endogenous approach to social effects on mitigation policy

Despite widespread concern about climate change, some countries have experienced public resistance to mitigation policies expressed either through the rejection of a top-down approach, ie, elections or referendums and through bottom-up mobilisation such as social movements. The reason behind this resistance is attributed to the gap between citizens' environmental attitudes and actual green-friendly behaviour. The gap depends on both structural barriers and psychological ones. Structural barriers, such as poverty or the lack of infrastructure to mitigate climate change, may be lowered with social programmes and infrastructure investments. The attitude-behaviour gap is also highly influenced by psychological barriers both at the individual level, such as an individual's perception of being able to change his behaviour, ie, self-efficacy;[1] and, at the social level, such as social norms, that are shared rules of behaviour dictated, most of the time, by belonging to specific social classes. Academic literature usually presents the two barriers as separate. On the one hand, by trying to dismantle the structural barriers that citizens face in supporting policies (ie, people do not support mitigation policy because of poverty, inequality or restricted access to services or resources, so addressing these barriers will increase support for climate mitigation policies). On the other hand, the existing research focuses only on individual attitudes or beliefs and personal restriction under the assumption that agents have fixed preferences. In this analysis we take a further step integrating the two types of barriers by focusing on the spill-overs between structural and psychological barriers.

Individual perceptions of self-efficacy and social norms have political economy implications. Across different income groups and countries, people often hold socially embedded misconceptions about the economic effects of carbon taxation or their effectiveness and fairness effects. These perceptions are not exogenous individual traits but are influenced by what people observe in their daily lives. People tend to form reference groups based on their peers, who belong to the same social classes or regions, and these groups are governed by social norms that define what is considered fair, achievable and doable. When people hold incorrect perceptions it can undermine policy efficacy and acceptance, which in turn impairs its design. To build public support for climate action and encourage sustainable behaviour, it is essential to address the social norms governing different reference groups.

At the same time, as shown by Benabou & Tirole (2011), laws can also serve as a means of conveying information about societal values and norms, particularly in situations where there is uncertainty or a misunderstanding about the prevailing social norm: the attitude-behavioural gap associated with mitigation policy support falls into such a case. In a society where political parties prioritise (or neglect) mitigation policy and other citizen

[1] According to A. Bandura (2005), 'The evolution of social cognitive theory', in K.G. Smith, & M.A. Hitt (Eds.), *Great Minds in Management*, Oxford University Press, Oxford, p. 9-35, self-efficacy is the belief of having control over one's own actions and their consequences. In the example of climate change mitigation activities, the self-efficacy would be identified as the beliefs about whether it is felt that they have the material or cognitive capacity and control to implement the new behaviour defined by the policy. The cognitive capacity also entails an individuals' understanding of the policy.

priorities, the general attitudes towards these policies can become positive (or negative accordingly).

For instance, if political parties show a strong commitment to climate action, it can foster positive social norms around sustainability and encourage greater public support for mitigation policies. Conversely, if political parties neglect climate action, it can lead to negative social norms around sustainability, which can diminish support for mitigation policies.

Therefore, by demonstrating a commitment to climate action and sustainability, policymakers can help to shift societal attitudes and encourage greater public support for mitigation policies. Ultimately, this can be a powerful tool for driving positive social change and promoting a sustainable future.

To design policies that would change people's behaviour two issues need to be addressed: (1) policymakers need to recognise the strong interaction and co-evolution between policy design and social mechanism; (2) the design of policy should exploit the heterogeneity present in society, in terms of reference groups and social norms.

A model of co-evolution between policy design and support for mitigation policy

When designing our model, we have taken into account, first, that models for studying and testing climate-change policy need to account for the heterogeneity of agents, which is driven by people's income and reference group, their bounded rationality[2] and their social norms. Secondly, models must capture the influences that social and political institutions exercise on each other. Therefore, in our model citizens interact with each other via a peer pressure mechanism, while the interaction between political institutions and citizens occurs both (a) via political endorsement, ie, voting (having established the link between the citizen and the political institution), that is substantiated in electing the regional seats; and (b) through an accountability process (that establishes the link between politicians and citizens), that is identified with policy initiation or agenda setting designed in accordance with the attitudes of the voters. We calibrate the model by using data from the Elcano Royal Institute's questionnaire evaluating Spaniards' support for elements, tools and processes of a Climate Change and Energy Transition Law that was approved in May 2021.

We consider a population of agents interacting in a fixed social network. The agents are of two types: citizens and political representatives. Citizens have two constant characteristics: income class and geographical location (Spanish autonomous community), which determine their web of connections with other citizens. They are endowed with an initial opinion about their propensity to support a green policy (or a brown policy –ie, high carbon intensity–), and with two other individual parameters: their perception of self-efficacy and their sensitivity to peer pressure, ie, they are impelled to follow the social norms of a specific reference group. Citizens are part of a social network

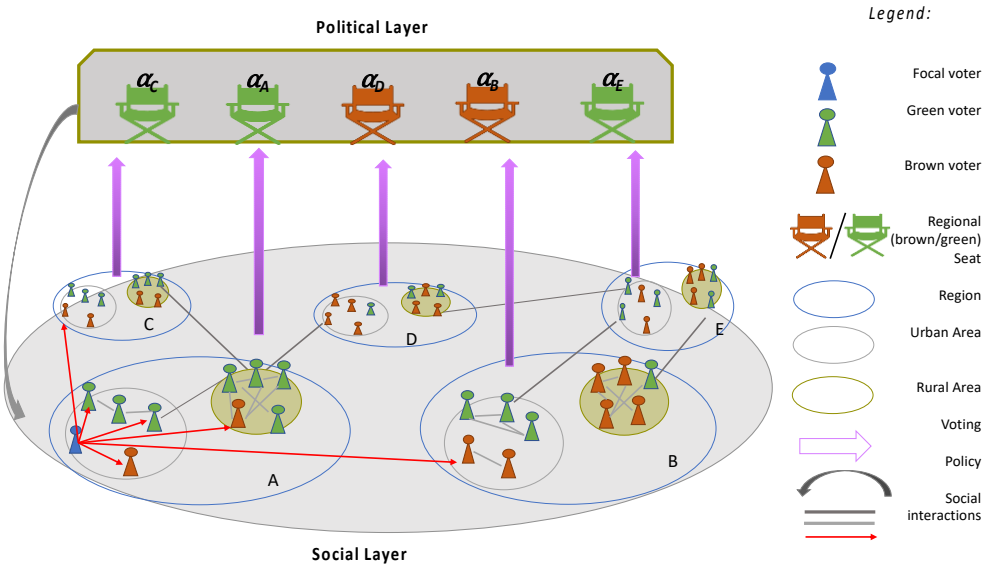
[2] According to Simon (1957), bounded rationality describes the way that humans make decisions that depart from perfect economic rationality because our rationality is limited by our thinking capacity, the information that is available to us and time.

according to their income class and location. Income class and location are the two main traits that govern the interaction among citizens: it is more likely that a resident in the urban area of Madrid will interact with other residents in the same area or with citizens residing in another region's urban area; however, the interactions between urban and rural residents (within and across regions) are not negligible.

Once the web of interaction is established for any citizen in the social network, we refer to it as a reference group. Within the reference group, citizens gather information about supporting (or not) a green policy. The reference groups impact the heterogeneity of regional support also. As for the political component, it represents the 17 Spanish autonomous regions and the two autonomous cities of Ceuta and Melilla (considered a single entity). The size of the political population is calibrated according to the actual seat distribution in the corresponding regional parliaments (from the following link). In the model, representatives are assigned to parties defending green or brown policies based on the community's political views. The community's political view is computed as the average opinion of the individuals belonging to the same region. This introduces the feedback we are interested in: the green propensity of citizens (ie, the likelihood of supporting green policies, working as any other dimension for policy preferences) matters for the election of seats, while seat colours (green or brown) matter, in turn, for policy decision and implementation.

The dynamic character of the model comes from the fact that citizen's opinions change according to three factors: (1) the income effect generated by a specific policy implemented (the policy can be progressive, regressive or have a uniform impact on citizens across income groups); (2) the citizens' sensitivity to peer pressure; and (3) their perception of self-efficacy, leading to a corresponding change in political representation. Figure 1 below shows the basic ingredients of the model in a schematic manner.

Figure 1. Structure and components of the model



The Model Dynamics: the Social Layer is composed of citizens distributed across regions and urban and rural areas. The interaction at the social level occurs through a probabilistic function that associate a higher probability of interaction between a resident of an urban area might interact

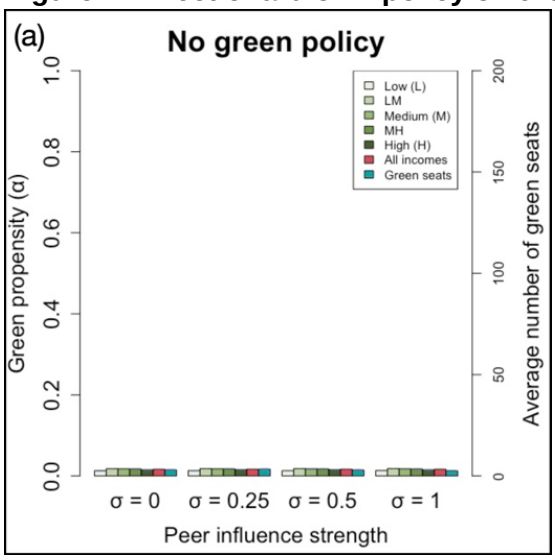
with people residing in the same urban area or other regions' urban area, and a lower probability that the former resident might interact with people living in non-urban areas. For example: the focal voter (the blue voter) resides in the urban area of region A but interacts with people from the same urban area and from the non-urban area of the same region, as well as with people of another region's (eg, B and C) urban area. Each region will support green or brown policies according to the propensity of their population (eg, region A has a majority of green supporters). Such support determines the colour of the regional seats associated with that region; for example, the seats associated with region A will be mainly green. The Political Layer is composed of regional seats. The seats (or set of seats per region) decide, following a probabilistic function based on majority rules, which policy will be implemented.
Source: the authors.

The evolution of green propensity is assessed by considering different kinds of policies that impact individuals in a distinct way with respect to their income classes. We present a regressive policy that has a greater positive income effect for high-income classes, while a progressive policy benefits to a greater extent the low-income classes. We then study the base-case scenario in which policies are uniform (they impact all income classes equally), accompanied by the middle policy that benefits the middle-classes more.

Lesson 1. Policy matters: mitigation policy must be promoted for social acceptance to gain traction

The evolution of people's support for climate-change mitigation policies needs to be studied through models that consider both economic incentives and peer influence. Whenever the political level does not show any interest in promoting mitigation policy, the average level of individual green propensity dissipates. This is shown in Figure 2 below, which depicts the final average level of green propensity among citizens (green bars for the five social income classes: a red bar for the population average) together with the average number of green seats at the end of the simulation (blue bar). The figure shows that a brown policy, ie, a policy that does not have any mitigation intent, such as subsidies for fossil fuels, has a dramatic effect on the evolution of people' green propensity, making it disappear. In other words, even if all citizens were motivated to change and were aware that such a change is necessary, no one would act alone unless forced by a legal power that functions as a catalyst. Policies work as coordinating devices for people's actions.

Figure 2. Effect of a brown policy on the level of support for green policies



Source: the authors.

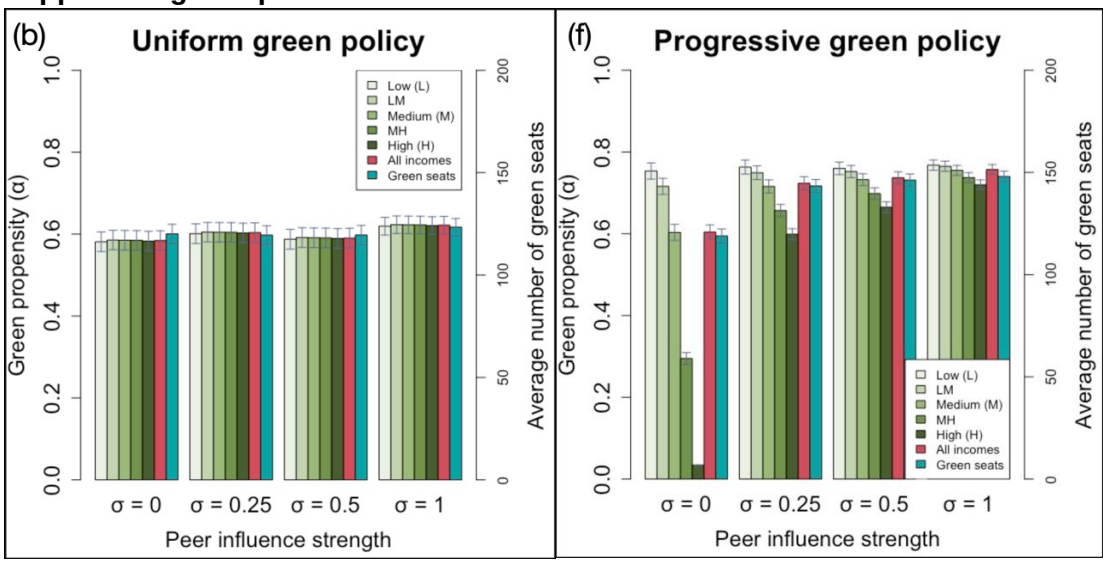
Lesson 2. Talk green: peer influence reduces the differences in green propensity across income classes

Peer influence strongly modulates the effect of belonging to different income classes on green propensity. As shown in Figure 3 below, whenever peer effect is null ($\sigma = 0$), the response to the policy is driven only by the individual propensity and the income effect relative to the policy. For example, a uniform policy produces the same effect on all the income classes, whereas a progressive policy results in a decreasing green propensity as we ascend the social ladder. When peer pressure, via social learning, increases its weight, then the single income effect starts to lose its power and the social effect increases the average green propensity non-linearly. In most policy scenarios, even a low peer-effect ($\sigma = 0{,}25$) has an impact, as in the case of the progressive policy scenario shown here. This indicates that listening to peers and incorporating the opinions of others in the evolution of their own opinion is a sign that social consensus is building up and, hence, that social norms start to influence the green propensity of people.

Such a strong effect of social norms has also been established experimentally. Moreover, whenever the population is strongly oriented towards green policy, their voices impact their voting choice (ie, the number of green seats increases), which in turn shapes the support for climate change policy measures among policy-makers themselves. On the other hand, it is also interesting to note how the peer effect modulates the income effect when progressive green policies are implemented. To see the effect in the figure we compare two different policies. On the left there is the uniform policy that produces the same effect for all income classes. In this scenario, the impact of peer pressure does not significantly alter the level of acceptance of a green policy. On the right, there is the progressive policy that is designed to meet the needs of low- and middle-income classes, according to principles of fairness and need in the redistribution of revenues. In this scenario, high income classes are impacted less positively than the others by the green policy, and indeed the green propensity of such classes is very small when agents are not exposed to peer pressure. Yet, when the peer effect kicks in ($\sigma \geq 0{,}25$) the green

propensity for the high-income classes increases. Such an increase is not determined by the income effect produced by the policy, but rather by the effect of talking to other people. Communication, via peer effect, functions as coordination device for green propensity, even when the policy does not benefit a person's income class.

Figure 3. Effect of a uniform (left) or a progressive (right) policy on the level of support for green policies.



Source: the authors.

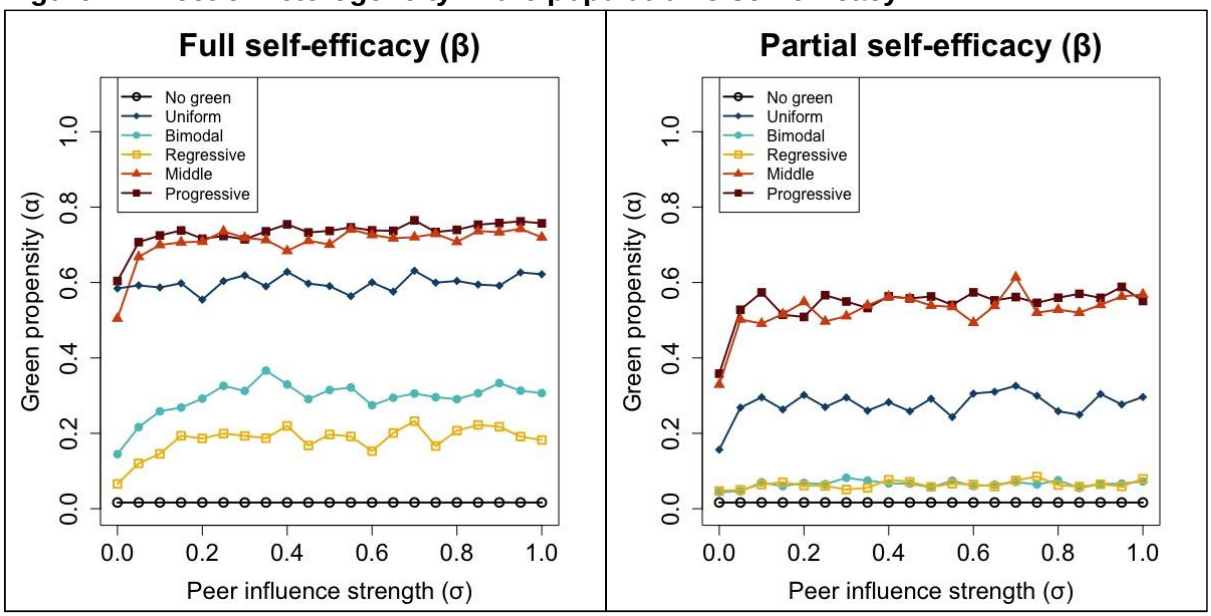
Lesson 3. Increase self-efficacy: assuming a homogeneously acting population is misleading as to the effect of policies

If a uniform policy (affecting all income classes equally) is designed with the assumption that all agents have the same capabilities and that its impact is not very different to that of regressive or middle policies (that impact middle classes more), the efficacy of the uniform policy is overestimated with respect to the real scenario in which self-efficacy (β) is heterogeneous. This can be seen in Figure 4, which shows the evolution of the average green propensity for a portfolio of policies affecting differently different income classes, when self-efficacy is the same for the entire population. For the two most relevant cases of highly progressive and uniform policies, both start off with a higher initial green propensity in the absence of peer pressure and are more able to maintain that higher support across income classes. Furthermore, the effect of peer pressure across the policy is different. Heterogeneity in self-efficacy is modelled taking into consideration that as we go down the social ladder, from high-income to low-income classes, the competences (ie, their understanding of the policy's economic and social implications) of individuals decrease. Heterogeneous self-efficacy does not have an impact on the ordering of policies, but the initial level of green propensity and, subsequently, its evolution, are across all policies lower than the scenario in which there is full self-efficacy across classes.

Hence, the assumption of a homogeneous self-efficacy, that assumes people would understand perfectly all the features of a policy, would induce wrong estimations of final acceptance. Even though the choice of policy addresses the severe economic impact that a green policy creates, the limited self-efficacy of people towards the policy impairs

their capacity to take advantage of it and reduces their support. When facing the decision of how to change their behaviour, low-income classes would lean more often towards a curtailment policy (eg, turning off lights or driving less) rather than engaging in more complex (perhaps costly) green decisions such as investment in energy efficiency improvements, solar roofs or taking advantage of tax or financial benefits. Thus, the efficacy of the set of policy instruments associated with middle and progressive green policy decreases and so does the general individual's acceptance rate. Hence, to increase the acceptance and efficacy of policies, their makers might consider designing complementary interventions aimed at increasing self-efficacy across income classes.

Figure 4. Effect of heterogeneity in the population's self-efficacy



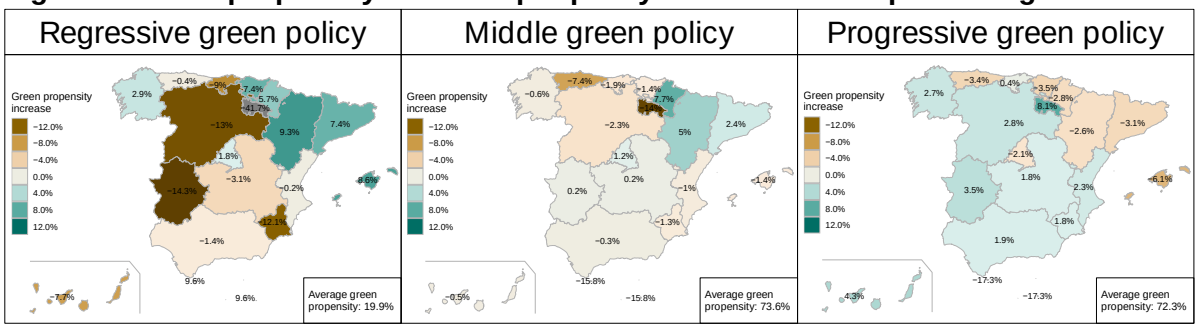
Source: the authors.

Lesson 4. Policy mapping: regional differences in policy effect may be large and lead to the failure of national policies

The implementation of national mitigation policies cannot be done without also considering the regional capacity differences within a country. In Spain, some regions react more positively to specific policies than others, as shown in Figure 5, representing the difference in propensity that each region has with respect to the average national propensity. We look at this difference in three green policy scenarios: the regressive, the middle and the progressive. Brown (green) regions are those with the largest negative (positive) difference, meaning that their propensity is far below (above) the average national propensity. As is the case for individual income classes, the regions that are on average poorer are those most negatively impacted by regressive policies. Consequently, their final level of green propensity tends to be lower (eg, Extremadura is the most impacted region in negative terms, at -14.3% below the average national level), while these regressive policies benefit the regions that are richer (eg, Aragón is greener than the other regions, being 9.3% higher than the national average).

Once we apply a more progressive policy, we can see the transitions towards maps that are greener in opposite regions. The comparison between middle and progressive policies adds further insights. We can see that given a similarly high level of national average green propensity of around 73%, the two scenarios are polarised in opposite ways: communities where high-income classes are present (such as Aragon, Catalonia and Madrid) are above the national average when a middle green policy is implemented, while the reverse is true for a progressive policy. These results are a strong indication that regional heterogeneity is also a source of relevant information. Climate change is a global phenomenon with a local impact. Climate change cannot be fought at the expense of a certain region and policymakers need a deeper understanding of impacts when designing national and regional policies. According to the OECD report, the lack of horizontal (eg, different methods of gathering data on GHG emission) and vertical (eg, the lack of subnational authority in energy supply, or limited access to green finance) coordination between national and subnational governments reduces the possibility of the latter to reach their full mitigation potential. To solve this policy misalignment between national and subnational governments, policymakers need to strengthen the coordination at the national and local levels in developing and implementing plans, policy tools, and localised reporting and monitoring frameworks.

Figure 5. Green propensity variation per policy effects across Spanish regions



Source: the authors.

Conclusions

The challenge of climate change calls for a deeper understanding of the determinants and the dynamics of climate policy support. In the climate change modelling literature, the socio-political processes that determine climate policy are treated as exogenous. In this analysis we identify relevant feedback processes between social and political levels, present in a vast and interdisciplinary literature, and connect them in a stylised model of the climate-social system aimed at understanding how to achieve higher support for climate-change mitigation policies.

The main policy lesson is that the support for climate-change mitigation actions depends on the coevolution of policies and social contexts. For this reason, the design of environmental and climate policies should account for it. We applied our framework to green policy analysis and developed a model of political support of climate mitigation policy with socially embedded agents, obtaining four main policy implications.

Lesson 1

Policy matters: whenever the political network shows no interest in promoting mitigation policies, the strength of green propensity dissipates, at any level of peer pressure, and the political green representation disappears. If, instead, the political layer starts showing an interest in mitigation policy, the evolution of citizens' green propensity and the number of representatives sustaining the green policy start to rise. This result does not imply that grassroots intervention is inconsequential, but that it alone will not be effective in pushing the green agenda. Political activities and grassroots commitment are two complementary forces in the climate-change mitigation scenarios. Thus, regulations are necessary instruments to sustain citizens' green propensity, but acceptability of the green policy depends on other factors.

Lesson 2

Talk and behave green: when peer pressure, via social learning, increases its influence, the single income effect starts to lose its power and the social effect increases the average propensity to accept green policies non-linearly. In fact, peer pressure has an increasing impact on any given income class's green propensity not only when a policy benefits it. Talking to other people, *via* peer effect, acts as a coordination device for green propensity.

Lesson 3

Increase self-efficacy: assuming people have the same self-efficacy regarding green policy adoption leads to wrong estimations of final policy acceptance. Therefore, to increase the acceptance and the efficacy of green policies, complementary and targeted policy actions aimed at increasing the self-efficacy of low-income citizens are necessary.

Lesson 4

Policy mapping: finally, the regional analysis shows that the national level analysis of green propensity only offers the policy maker a partial representation of reality. Policies that seem optimal nationally could have a reverse effect when observed at regional level. Middle policies increase green propensity in regions like Aragon, Catalonia and Madrid, while progressive policies decrease green propensity in these regions (and the Basque Country) but tend to increase in most of the remaining regions. To support the implementation of climate mitigation and adaptation policies at the local level, it is essential to gather information and data at subnational levels. Place-based recommendations and action checklists can be developed based on this assessment, providing locally-tailored recommendations that uniquely address the needs and characteristics of each locality. By taking this approach, policy reforms can better support the implementation of mitigation and adaptation measures that are effective, efficient and equitable for local communities.